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Dominions Apart: Reflections on the Culture of Science and
Technology in Canada and Australia 1850-1945

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Introduction

Roy M. MacLeod and Richard A. Jarrell

This collection is a foray into the comparative history of colonial science, a methodology—if we can yet characterize it as such—rich both in possibilities and promise but so underdeveloped that its practitioners have few signposts to guide them through the terrain. Comparative history has long been a staple of other historians, economic, literary and political, so it might seem surprising that historians of science have been so dilatory.¹ One can explain this lacuna partly by the late emergence of history of science as a professional discipline and by the way that discipline has evolved. Until recently, the panoptic vision of the general historian has often been lacking in the more narrowly-focussed studies in the history of science. Compounding the problem, at least for those who study the science of smaller nations, has been the lack of comprehensive histories of national science.² Ideally, the comparison of even two national scientific enterprises demands of its student a wide-ranging familiarity with two cultures in all their ramifications. Given the growth of disciplinary specialization, comparative history of science must steer between the Scylla of excessive detail and the Charybdis of oversimplification.

The primary questions for the would-be comparative historian are *what* to compare, and *why*. Neither is simple to state clearly. This volume attempts to compare and contrast two colonial and national sciences, of Australia and Canada, mostly within a disciplinary framework. Such an approach assumes that one can construct persuasive accounts of the growth of a discipline in each country, and then, by juxtaposing them, find the points of comparison. We cannot expect to find a one-to-one correspondence by such juxtaposition, given the uniqueness of any national experience, but are content to discover parallel themes. There exist many bases for comparison: economic, infrastructural, political or biographical. The essays that follow explore all these avenues in varying degrees. To extract from them general methodological guidelines would be premature but we can delineate several points of contact.

- 1 Little comparative work on science in the British or French empires exists. Colonial history still commands attention, as in the recent work of James McClelland, III. For important work on the French and Dutch Empires, see Lewis Pyenson, *Civilizing Mission: Exact Sciences and French Overseas Expansion, 1840-1940* (Baltimore: Johns Hopkins University Press, 1993) and *Empire of Reason: Exact Sciences in Indonesia 1840-1940* (Leiden: E.J. Brill, 1989).
- 2 None exists for Australia. The last attempt at comprehensive coverage for Canada (H.M. Tory's *History of Science in Canada*) appeared in 1939. There exist, however, many disciplinary and institutional histories in both countries, but large gaps still exist.

The *why* question is more subtle. Initially, the question holds more interest for the sociologist than the historian. If science is an international and universal enterprise, why did it develop at different rates and in different ways in some countries, while hardly evolving at all in others? Ben-David's account of shifting scientific leadership was a pivotal study.³ For historians, the comparative aspect became important with the emergence of the idea of colonial science, seen as a series of stages taking a nation from scientific dependency to self-sufficiency.⁴ If one has a model of scientific growth in a developing nation, a comparison with similar examples provides an excellent test for that model. Thus, the specific steps in the historical evolution of a particular nation are less important than the generalizations we can draw from identifying the same processes in more than one national context.

Why choose Australia and Canada? The parallels are obvious. Both were children of the First British Empire, both were recipients of the vast emigration wave of the nineteenth century yet, both have 'frontier' and 'bush' traditions that helped shape colonial national identities, and both maintained their political and social bonds with the mother country for many decades while simultaneously developing their own visions and cultures. Both nations evolved with few population centres and enormous, practically empty hinterlands. Both depended on foreign capital and were dominated by foreign ownership. Both laid claims to extraordinary natural resources on which their economies depended, and both had to "deal with" indigenous non-white populations. And, in both cases, science and the industrial revolution of iron and steam came ready-made to use for development. The ideal of practicality, articulated differently in each case, was a powerful force in the organization of society—a society in each case that seemed to reward physical endurance more than intellectual achievement.⁵ Apart from the semi-mystical familial bonds that both countries share, it is striking the degree to which modern Australians and Canadians find their visions compatible with one another, while divergent from the culture of Britain or of their (perhaps) more successful cousins, the Americans. One is ineluctably drawn to finding, and questioning, parallels in their development.

3 Joseph Ben-David, *The Scientist's Role in Society: A Comparative Study* (Englewood Cliffs, NJ: Prentice-Hall, 1971).

4 The key work was that of George Basalla, 'The Spread of Western Science,' *Science* 156 (5 May 1967), 611-22. For more recent analyses, see Roy M. MacLeod, 'On Visiting the "Moving Metropolis": Reflections on the Architecture of Imperial Science,' in Nathan Reingold and Marc Rothenberg (eds.), *Scientific Colonialism: A Cross-Cultural Comparison* (Washington, DC: Smithsonian Institution Press, 1987), 217-49, and Richard A. Jarrell, 'Differential National Development and Science in the Nineteenth Century: the Problems of Quebec and Ireland,' *ibid.*, 323-50.

5 Roy M. MacLeod, 'The "Practical Man": Myth and Metaphor in Anglo-Australian Science,' *Australian Cultural History* 8 (1989), 24-49.

Realistically, we cannot overlook equally obvious differences. Canada has twice the population of Australia, and distinctly different traditions of settlement. Australia, for all its convict origins, soon acquired different traditions—the gold-rush towns of Victoria, ‘the farmer settlements’ of South Australia, and the semi-tropical plantations of Queensland. In Canada, the French fact had, and has, an important impact upon political evolution. The emergence of federalism, with its substantial import for scientific institutions and funding, came several decades earlier in Canada than Australia. Their geographies, climates and origins differ dramatically. Perhaps the single most decisive difference in the domain of science lies in the proximity of the United States of America: Canada lives next door, and Australia does not. The influence of American scientific institutions, education, industry and trade has always had an immediate impact upon Canadian development. American models have strongly influenced Australia, too, but the ‘tyranny of distance’—in a trans-oceanic sense—allowed for a different and more gradual process of commercial, political and intellectual influence to occur. A central theme in Australian history is the fact of reliance—until the Second World War—upon Britain for ideas, people and technology. Canada’s reliance upon British exemplars faded much earlier, given the lack of insulation through distance and time.⁶

Although the nine articles in this collection represent different historiographical approaches, they fall into four thematic areas. First, three essays consider aspects of the ‘culture’ of science in Canada and Australia. Roy MacLeod explores the relationships among the Australian version of progressivism, notions of practicality and visions of Australia’s place in the Empire. The resulting amalgam, he argues, produced a characteristic style of cultural nationalism continuing through Federation and well into the present century. Richard Jarrell examines the role of the state in Australian and Canadian science before the First World War, suggesting ways to use government expenditure accounts to trace the contours of state-science interactions. A comparison of both countries shows remarkable similarities—some self-conscious, and deriving from common models, while others erive from the physical environments within which encounters took place. However, as Rod Home argues, the history of Australian physics suggests that we should not necessarily assume that disciplinary growth follows the same path in all colonial contexts. He shows how a ‘Humboldtian’ framework, with a special orientation towards meteorology and astronomy, shaped the physics community in Australia. It remains to be seen whether Canada’s environmental agenda similarly shaped physics in

6 For general themes on Canada, see Trevor Levere and Richard Jarrell, (eds.), *A Curious Field-Book: Science and Society in Canadian History* (Toronto: Oxford University Press, 1974) and Bruce Sinclair, N.R. Ball and James O. Petersen, (eds.), *Let Us be Honest and Modest: Technology and Society in Canadian History* (Toronto: Oxford University Press, 1974); for Australia, see Ann Mozley Moyal, *Scientists in Nineteenth Century Australia: A Documentary History* (Stanmore: Cassell, 1976).

Canada. What is clear, is that the organisation of colonial and national science, if at first celebrating American and British forms, eventually acquires an independent identity, structured to a large degree by the geographical, political and institutional landscape.

It is impossible to follow a theory of strict environmental determinism, however, because this landscape was shaped by key individuals, inevitably fewer and more influential than their counterparts in larger communities. The essays in Part II reflect upon individual scientists in relation to the vast, often inhospitable physical environments of Australia and Canada. David Branagan and Suzanne Zeller focus upon the careers of three geologists: Sir William Logan, founder of the Canadian survey and consummate scientific politician; Alfred Selwyn, pioneer geologist in Victoria and Logan's successor in Canada, the antithesis of the politician; and H.Y.L. Brown, the Nova Scotian loner who spent most of his career in South Australia. Their career patterns mirrored the changing relationship of governments and their scientific servants. Nancy Christie follows the peregrinations of Griffith Taylor, the founder of Australian academic geography, who sought to create a geography based upon the physical sciences and to develop a theory of environmental determinism. His peregrinating tenure—first at Sydney, then in Chicago and Toronto—began with high hopes and ended with disillusionment as other, more social-science based geographical visions overtook his own.

The third section discusses the rise of anthropology in both countries, as exemplifying the application of scientific methods to the encounter—some might say, the 'fatal encounter'—between Europeans and indigenous peoples in these settler colonies. In both Canada and Australia, colonial anthropology originated in a metropolitan desire to 'salvage' the dying aboriginal cultures to reconstruct what was assumed to be an earlier phase of human history. D.J. Mulvaney argues that prevailing notions about Aborigines—that they lacked a sophisticated culture and social organization—constrained the amateurs who founded the field, and the professionals who followed them. The anthropologists' detachment supported official policy that, in turn, has contributed to the continuing sorry plight of the Aborigines during this century. Gail Avrith-Wakeam sees a similar situation in the foundation of Canadian anthropology, although Canadians were slower to cultivate the field. The early years saw a contest between George Mercer Dawson, of the Geological Survey, and Franz Boas, the independent German researcher, over who would analyze West Coast tribal culture. Dawson took his cues from British anthropology, emphasizing linguistic differences, while Boas was a champion of cultural anthropology. It becomes clear that the colonies not only gathered empirical evidence—limiting them to a role of 'inventory science' becomes a facile caricature—but also contributed significantly to its theoretical interpretation. Not surprisingly, professional debate at the periphery bore all the hallmarks of nationalism and professional jealousy that were seen in contemporary metropolitan institutions.

Our last thematic area considers several aspects of the interface between scientific knowledge and technology. Chemistry was the most important science-based industry in both Australia and Canada, as indeed it was in Britain and much of Europe. James Hull, Ian Rae and Andrew Ross offer three case studies illuminating different dimensions of colonial experience. The rise of small-scale chemical industries in Victoria from mid-century is the story of transferred European technology plus local adaptations. The Canadian situation was little different. After the turn of the century, public and private bodies cooperated in applying scientific principles to the problems of pulp and paper, leading to the rapid development of that Canadian industry. Australian chemical industries in the interwar years exhibited a similar cooperative spirit, although military needs became increasingly a driving force that touched science in all its disciplines. David Zimmerman compares the adoption of high technology—shipboard radar—during the Second World War by the Royal Australian and Royal Canadian navies, and argues that Australian organizational superiority meant a much more rapid and successful adoption of new technology by the RAN. That wartime distances separating Australia from Britain gave it the freedom, as well as the necessity, to innovate, is a common feature of Australian history during both world wars. Yet, Canada's linkages to Britain and the United States seemingly conspired to defeat a similar independence of action.

After 1945, Australian and Canadian science and technology continued, or reverted to, traditions of organizational dependence, but these took increasingly, in both cases, American lines. For the post-war generation, the place of science in contributing to 'national identity'—a theme of increasing historical interest today—was overshadowed by a tendency to justify national scientific priorities in terms of international research goals, disciplines and networks. Today, we think globally, but act locally; and while the international project has become of central importance, there is much to be said about the importance of persisting styles, contexts and choices, inherited from the colonial past, which give a particular character to the politics of science in the two countries.

These cases do not pretend to cover the length and breadth of Canadian or Australian science; nor do they even attempt to compare contemporary trends in science education, medicine, and engineering.⁷ The ingrained notions of state intervention in both nations, though different in emphasis, suggests that we can exploit a rich vein of material on science-state relations. Linkages between individuals, spaces and political motivations remain to be explored.

7 For some of the more recent historiographical visions, see R.A. Jarrell and J. Hull, (eds.), *Science, Technology and Medicine in Canada's Past: Selections from Scientia Canadensis* (Thornhill: Scientia Press, 1991); R.W. Home, ed., *Australian Science in the Making* (Cambridge: Cambridge University Press, 1988) and Roy M. MacLeod, (ed.), *The Commonwealth of Science: ANZAAS and the Scientific Enterprise in Australasia 1888-1988* (Melbourne: Oxford University Press, 1988).

Whether Canada and Australia form a natural basis for comparison, or whether their separate political histories make them irreconcilably 'Dominions Apart,' their stories do unfold in parallel, and reflect a comparative light. Histories of settler colonies that treat each separately can, we believe, benefit from a perspective that invokes these problematic comparisons, and prepares the ground for more intensive work in the future.